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THE FAMILY OCCUPANCY TEST
6 NOVEMBER 1960

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ABSTRACT

The USNRDL experimental shelter at Camp Parks, California, was occupied for a period of 48 hours by 99 men, women, and children. Ages of the participants ranged from about 3 months to 68 years. Family size ranged from single persons to a family of seven. All aspects of the shelter environment as well as the actions and responses of the shelterees were monitored. Children of all ages appeared to adapt well to shelter conditions, but the importance of careful preparation, organization, and control of activities was demonstrated. This is a preliminary report made in advance of complete analysis of the data.

SUMMARY PAGE

The Problem

Two prior experiments using all-male volunteers have established the basic habitability of the USNRDL 100-person experimental shelter. The next step was to determine experimentally the adequacy of shelter equipment and procedures, shelter diet, and management methods, under conditions involving a group of families and single persons of a wide range of family size and age groups, with particular attention to problems associated with very young (pre-school-age) children.

Findings

1. The conditions of shelter living used in this test were accepted readily by all shelterees. Children, in particular, had no difficulty in adjusting to shelter life. No unmanageable problems arose.

2. As noted in prior experiments, noise remains the most annoying feature of shelter living. Organized activities are the key to the control of noise and temperature. Periodic quiet times were welcomed.

3. Medical problems were minor. Mild anxiety reactions were observed in some mothers of young children at first, but these disappeared after the first night in the shelter.

4. Shelter facilities were generally satisfactory. Newly-designed fibreboard furniture performed well. Simple means were found for the care of very young children.

5. The experimental wheat diet was generally satisfactory to all but the very young. Initial resistance of children to the strange diet, often patterned after their parents' reactions, subsided in most cases before the end of the test.

6. Shelter management methods were generally effective. The necessity for a comprehensive schedule of organized activities,

especially for children, was demonstrated. This experimental group was a fertile source of ideas for group activities that resulted in a richer and more satisfying social experience for all participants.

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SECTION 1

INTRODUCTION

1.1 BACKGROUND

The end objective of the USNRDL shelter research program is a standardized shelter design that meets certain performance specifications at a cost as minimal as the present state of knowledge permits. The shelter under consideration is a buried flexible-steel-arch structure, 25 by 48 ft, housing 100 people. Performance specifications, detailed plans, and estimated costs for this shelter were developed in Ref. 1. Details concerning the shelter design will be found in Refs. 1 and 2. A sketch of the USNRDL experimental shelter is shown in Fig. 1.1.

A 2-week human occupancy test using volunteers from the Santa Rita Rehabilitation Center was accomplished during the period of 3-17 December 1959. The preliminary results of that test will be found in Ref. 3. Consideration of the findings from the 2-week experiment indicated that most of the information desired could be obtained by a much shorter stay-time. Accordingly, a 5-day experiment was conducted during the period 25-29 July 1960. The preliminary results of that test will be found in Ref. 4. The 5-day test, using volunteers from the Santa Rita Rehabilitation Center, was for the purpose of obtaining habitability information during hot summer weather, and to test modifications of shelter components suggested by the previous test. The experiment confirmed the conclusion that significant results could be obtained in occupancy tests of relatively short duration. It appeared that most shelter living problems were met and solved during the first 48-72 hours of occupancy. Consequently, a third human occupancy test of 48 hours' duration was conducted on 4-6 November 1960. The shelterees were men, women, and children. The duration of the test, which occurred on a weekend, was selected because of the foregoing observations and because of the relative ease of obtaining volunteers for such a period. This report is a preliminary statement of the results of that test, together with tentative findings in advance of complete analysis of the data obtained. A final report combining the results of all occupancy tests will be prepared at the conclusion of the project.

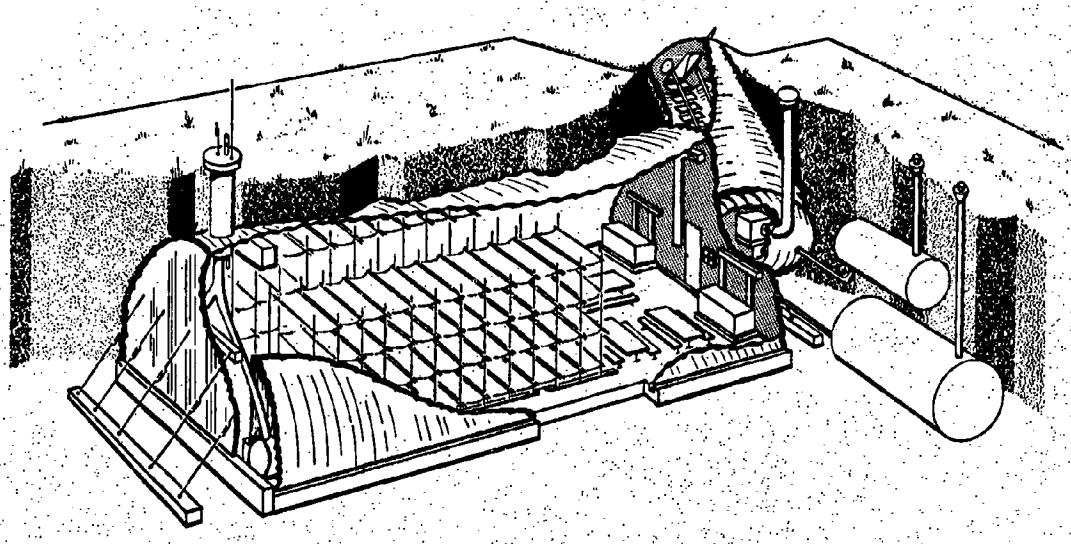

Fig. 1.1 USNRDL Experimental Shelter

1.2 OBJECTIVES OF THE TEST

The objectives of the November 1960 test were:

1. To determine experimentally the solution to problems of shelter management involving a group of families and single persons of a wide range of family size and age groups, with particular attention to problems associated with very young and pre-school-age children.
2. To test the adequacy of shelter equipment and procedures.
3. To determine the suitability of an experimental shelter diet.

1.3 METHOD OF APPROACH

Ninety-nine volunteers, mainly family groups, occupied the shelter for a period of 48 hours. (It was intended to use 100 shelterees but one individual failed to indicate his inability to participate and was not replaced.) The participants consisted of 49 males and 50 females. The largest family unit consisted of 7 persons. Ten single persons participated. The youngest participant was about 3 months old; the oldest, about 68 years old. During the test period, all aspects of the shelter environment were monitored, as well as the actions and responses of the shelterees. Daily medical conditions and environmental conditions were recorded. Suitability of experimental furniture and shelter equipment was observed. The subjective reaction of the shelterees to management procedures, shelter diet, and living conditions was recorded.

1.4 LIMITATIONS

This is a preliminary report made in advance of a complete analysis of the data. Its purpose is to provide the Office of Civil Defense and others engaged in the design and experimental testing of shelters with provisional information that may be useful in their work. All statements herein are subject to modification or change during subsequent analysis.

SECTION 2

EXPERIMENTAL PROCEDURE

2.1 EXPERIMENTAL FACILITIES

The experimental facility consisted of a fully-outfitted shelter and an instrument house that contained recording equipment and office space for support personnel. The experimental arrangements were those used in the July 1960 test,[4] except as described in subsequent paragraphs.

2.2 EXPERIMENTAL PERSONNEL

Volunteers were encouraged from among the families of the staff of USNRDL and of OCDM Region VII headquarters at Santa Rosa, California. The nature of the proposed experiment was announced to the Laboratory staff on 7 October 1960. A briefing was held in the auditorium on 11 October for interested staff members, following which a call for volunteers was issued. A total of 105 volunteers responded. A similar briefing and call for volunteers at Region VII headquarters on 12 October 1960 resulted in 31 volunteers. Additionally, the Director of the California Disaster Office and his family volunteered. Of these volunteers, 92 were selected in such a way as to approximate the following characteristics:

1. 50% males and 50% females.
2. 50% adults and 50% children.
3. Children divided equally among pre-school-age, elementary-school-age, and teenagers.
4. An adequate range of family size from single persons to large families.
5. Extreme ranges in age, if possible.

No attempt was made to select a "representative" population. Rather, the emphasis was on the inclusion of individuals and families that represented as many of the potential "problems" of shelter living as could be obtained under the circumstances. All volunteers not initially selected were held as alternates in event of dropouts. A number of dropouts occurred and were replaced from the alternate list. A list of the participants and their characteristics is given in Appendix A.

In addition to the 92 "shelterees," there were 8 persons in the experiment who were regarded as a part of the experimental team. Four of these people were on the staff of the USNRDL: W. E. Strope, shelter commander; D. P. Schultze, engineering assistant and deputy commander; CAPT H. S. Etter, (MC), USN, physician; and LTJG E. S. Perry, USN, environmental measurements. CDR Katherine Kendall, R.N., senior nurse officer in the U. S. Public Health Service, Division of Health Mobilization, Atlanta, Ga., aided in problems of infant, child, and female care in the shelter. Eleanor Taylor, one of the developers of the experimental wheat diet at the Western Regional Research Laboratory of the Agricultural Research Service, Albany, Cal., supervised the preparation and service of food. Finally, Mr. and Mrs. Howard Huey, Navy hospital corpsmen from the San Francisco Naval Shipyard, aided the physician.

All experimental personnel were given a medical examination within 72 hours of the beginning of the test. The principal purpose of the examination was to exclude persons suffering from or having been exposed to communicable diseases.

2.3 ENVIRONMENTAL MEASUREMENTS

The principal environmental measurements made during this experiment were accomplished manually by persons in the shelter. Noise level measurements were made hourly at points 3, 4, and 5 of Fig. 2.1 and on special occasions when deemed appropriate, using a General Radio Type 1551-A portable sound level meter. Wet- and dry-bulb temperature measurements were made hourly at points 1, 2, 3, and 5 of Fig. 2.1, using a Weston portable wet- and dry-bulb thermometer device with battery-powered fan. Oxygen and carbon dioxide measurements were made at approximately 4-hour intervals at points 3 and 5 of Fig. 2.1, using a Beckman Model D portable deflection-type oxygen analyzer and a "FYRITE" Model CND fluid-type CO_2 analyzer.

Continuous measurement of carbon monoxide concentration was made by drawing air from the shelter by means of plastic tubing to the instrument house where a recording analyzer built by the Pacific Southwest Forest and Range Experiment Station (U. S. Department of Agriculture, Forest Service) was located. This is the equipment used in previous tests. A few interior thermocouple stations were also activated for comparison with the temperature measurements made in the shelter. However, most of the heat-measuring systems used in previous tests were not activated since the habitability of the shelter is now well established.

2.4 MEDICAL ASPECTS

A physician and two hospital corpsmen assistants participated in the experiment. A sick call was held once a day at which oral temperatures

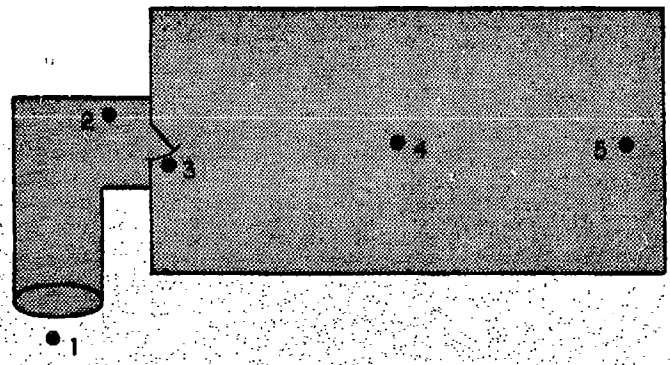

Fig. 2.1 Location of Environmental Measurements

of all shelterees were recorded and their general condition evaluated. As in previous tests, shelterees slept head to toe to minimize transmission of respiratory infections. On 14 November, about 1 week after the experiment was concluded, the shelterees executed a supplementary shelter questionnaire that included several medical questions. (See paragraph 2.9.) Similar questions were asked of a control group of 100 persons who did not participate in the test. These data were used to assess any increased incidence of respiratory infections resulting from the occupancy test.

Fluid intake, urinary output, and weight changes were not measured in this experiment.

2.5 SHELTER COMPONENTS

The 5-day summer weather occupancy test of 25-29 July 1960 indicated that a number of minor modifications to shelter components would improve the habitability of the shelter. These modifications are described in the following paragraphs.

2.5.1 Bunk System

The December 1959[3] and July 1960[4] occupancy tests demonstrated that the bunk system was satisfactory. Certain modifications suggested by the December test improved the habitability and decreased the cost of the bunks but minor deficiencies were disclosed by the July test. These deficiencies consisted of (1) tearing of stitches connecting the tie flaps to the sheet and some tearing of the grommets in the tie flaps; and (2) bunk sheets creeping along the bunk pole (cross pole) under the weight of the occupants because the sheets were not restrained at their extremities. Also, the July test helped to evaluate new developments such as four simple types of connectors for joining the bunk poles to the uprights and various canvas weights for the bunk sheets.

The July test demonstrated that No. 12 duck canvas sheet was of suitable strength for a 2-week occupancy. Consequently, this weight of canvas was used in the fabrication of new sheets. To prevent the sheet from creeping along the bunk pole under the weight of the occupants, a loop was sewn into each end and steel "S" hooks were provided to connect the canvas loop to the end of the bunk pole (Fig. 2.2). The "U" clip type connection was used exclusively for this test. In an attempt to prevent the poles from rotating and thus to cut down on sheet movement, studs and slots were added to one-half of the clips and poles in the system. (See Fig. 2.3.)

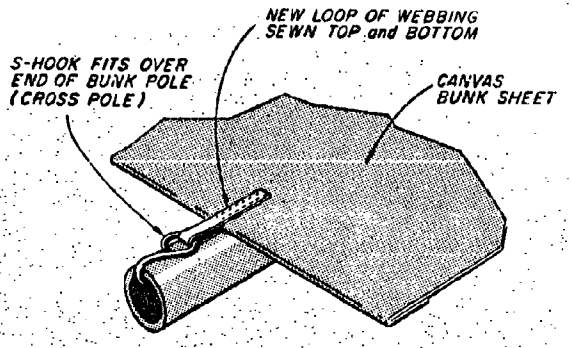

Fig. 2.2 "S"-hook Preventer for Canvas Bunk

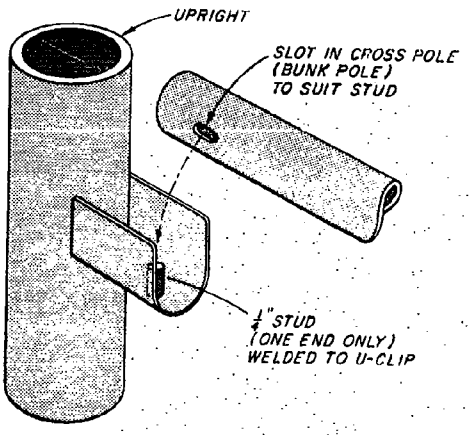

Fig. 2.3 "U"-clip Connectors for Bunk Framing

2.5.2 Toilet Facilities

To improve the general appearance of the chemical tanks, all metal parts were given two coats of white enamel paint. In addition to this, light sheet metal coving was added to the front and rear of the tanks to close up undesirable cracks. This also afforded a small shelf in the rear for placing toilet paper.

A new portable pipe framework was erected over the tanks to provide privacy. This framework was covered with a one-piece canvas assembly with divider strip and two entrance sheets located about 2 ft apart.

2.5.3 Air Supply System Noise

In an effort to lower the noise level produced by the air supply system, the ventilation fan foundation was shock-mounted, using the absorbers recommended by the fan manufacturers. Fan bearings were rebuilt or replaced for quiet operation. All duct connections to the fan were replaced with flexible canvas joints and all exposed ductwork on the interior of the shelter was soundproofed with 1-in. fibreglass insulating material.

2.5.4 Exhaust Ventilator

In order to raise and lower the exhaust ventilator more easily, sandbag counterweights were used in the July test. This method of counterbalancing the ventilator was found to be unwieldy. To correct this condition, a system of enclosed iron counterweights and pulleys was installed on the rear wall and overhead.

2.5.5 Furniture

During the December 1959 occupancy test, shelterees complained that there were not enough seats. To correct this deficiency, newly-developed corrugated-fibreboard chairs and benches were tried in the July 1960 test. The results of this test revealed the following deficiencies:

1. The entire lot of fifty folding type chairs failed completely in 36 hours.
2. The ten benches, although in rather poor shape, did last the full 5 days.

A structural analysis of the chairs indicated that the chairs were essentially strong enough but that no provision had been made to lock the interconnecting slots tightly. It was found that any rocking motion imparted to the chair by the user would cause the seat section to work

loose from the back. When the seat separated, the entire load of the occupant was placed on the taped top of the back causing a failure in direct shear.

Investigation of the benches showed that the design was basically sound but that corrugated fibreboard with too light a bursting strength had been used. In addition, it was noted that the cement floor was extremely rough, causing an abrasive action on the edge of the pedestals. It was concluded that the pedestals should have a greater contact area to cut down on abrasive and crushing effects.

Based on the above observations, discussions were held with Norman Steuer Associates (designer) and the Longview Fibreboard Co. (fabricators), to correct the faults. A lock-type tongue to be cut from a portion of the seat was designed so as to connect through the pierced back. A wooden pencil or dowel pin would then be placed through a hole in the tongue, locking it against the back.

Further inquiry into the possibilities of heavier corrugated fibreboard revealed that there were two heavier varieties made in double walls: 350-lb and 500-lb bursting strength. The triple laminated material was not considered as it was entirely too rigid for any bending of flanges required in fabrication of the furniture.

Two prototype benches and chairs were fabricated for testing. The benches were of two designs: one four- and one five-pedestal type. The bench tops were made in two interchangeable types: a 500-lb bursting strength top with flanged sides slotted to receive the pedestals and one top of two 350-lb laminations. Chairs were made of two types: 350-lb and 500-lb fibreboard.

The chairs and benches were then placed in use in the USNRDL cafeteria for a 2-week period. During this time every effort was made to expose the chairs to maximum wear. It was observed that people actually walked and jumped on the horizontal surfaces with no appreciable destructive effect.

During the cafeteria test of the benches and chairs, Mr. Steuer was contacted for a possible table design of corrugated fibreboard. A prototype was designed that fulfilled all requirements. However, when the table model was turned over to the production engineers of Longview Fibreboard Co., problems arose in handling through the machines. The engineers found that the one-piece tops and zee-type supports could not be punched in one operation. This would lead to an extra process through the machines that would raise the cost higher than had been estimated.

One simplified prototype was fabricated and tested. This table was found structurally unstable in the lateral direction. This was due to the deletion of a diagonal member in the original design. A revised version was then designed and made up; however, unfortunately, it was not available in time for this test.

Following the 2-week preliminary test in the cafeteria, the furniture was examined for defects and failures. Although both performed satisfactorily, the five-pedestal type bench with the 500-lb bursting strength top was selected over the four-pedestal type to give an extra margin of safety. The 500-lb fibreboard chair, which also was to prove quite satisfactory, was selected over the 350-lb model for strength despite the better comfort offered by the softer chair. Ten benches and 50 chairs were procured for this test.

2.5.6 Washing Facility

In planning for the mixed-population test, consideration was given to the provision of facilities for sponge bathing for women and babies. It was decided that a portable enclosure that could be set up on request would provide the necessary privacy. A simple four-sided folding screen enclosing an area 3 by 3 ft and containing a folding plywood shelf was constructed. A wash basin, hand soap, and clean rags for toweling were included in the shelter supplies.

2.6 DIET AND FOOD SERVICE

2.6.1 General

The diet used in this experiment was based on the cereal wafer[5] developed by the Western Regional Research Laboratory (WRRL), Agricultural Research Service, USDA. Essentially the same diet had been used in the July 1960 test with considerable success. Consideration of cereals as a basis for an economical shelter diet is natural because they are abundant, low-priced, and have formed the backbone, historically, of austere, energy-producing diets since the development of agriculture. The specially-formulated wafer developed by WRRL consists principally of wheat. The wafer can be eaten out of hand, spread with jam or peanut butter; can be crumbled and served with milk and sugar as a breakfast food; or can be crumbled and served with hot soup, sauce, or gravy as a pilaf-type main course for lunch or dinner. These means of gaining variety and compensating for lack of palatability are all employed in the experimental diet.

2.6.2 Menu

Breakfast (every day)

Coffee - 1 cup
Milk - 1 cup (made up from powder)(use approximately 1/4 cup for cereal)
Wheat wafers - 4 (2 as cereal, 2 as crackers)
Sugar - 1 tbsp. for cereal + 1 tsp. for coffee
Raisins - 1/4-oz package
Jam - 1 tbsp.

Morning coffee break (every day)

Coffee - 1 cup
Sugar - 1 tsp.
Fruit-flavored carbonated drink for children (from individual powder or wafer packages)

Lunch (every day)

Milk - 1 cup
Instant cocoa - 1 tbsp.
Wheat wafers - 4 (2 as "pilaf", 2 as crackers)
Peanut butter - 1 tbsp.
Jam - 1 tbsp.
Toppings for cereal wafers (use 2 wafers crumbled)
Day 1 - Beef bouillon - 1/3 cup + cheese - 1 tbsp.
Day 2 - Beef bouillon with chili seasoning - 1/3 cup

Afternoon coffee break (every day)

Coffee - 1 cup
Sugar - 1 tsp.
Fruit-flavored carbonated drink for children (from individual powder or wafer packages)

Supper (every day)

Milk - 1 cup
Wheat wafers - 4 (2 as "pilaf", 2 as crackers)
Peanut butter - 1 tbsp.
Jam - 1 tbsp.
Candy - 1 pkg hard mint or fruit flavor tablets
Toppings for cereal wafers (use 2 wafers crumbled)
Day 1 - Tomato-vegetable soup - 1/3 cup
Day 2 - Spaghetti sauce - 1/3 cup

2.6.3 Instructions for Serving*

1. Coffee and milk - follow directions on packages.
2. Wheat wafers:

At breakfast, crumble 2 or 3 wafers and serve with 1/4 cup milk and sugar. Add raisins if desired, or raisins can be eaten out of hand.

At lunch and dinner, crumble 2 wafers and serve with appropriate topping. Other wafers can be spread with jam or peanut butter.

3. Jam or peanut butter -- serve one generously filled teaspoonful, which is approximately equal to 1 level tablespoonful.
4. Cocoa - add 1 level tablespoonful to 1 cup milk. Addition of cocoa to milk should be optional.
5. No separate milk allowance is made for morning and afternoon coffee breaks. Milk for breakfast cereal is also part of the total 3 cups per day allowance.
6. Basic bouillon - use 1 level teaspoon of powder for 1 cup water.

For 100 servings add 1-1/2 jars (3-1/2 oz size) of bouillon powder to 9 quarts of water. Serve 1/3 cup of prepared bouillon for 2 crumbled wheat wafers.

7. Bouillon with cheese - sprinkle 1 tbsp. grated cheese over bouillon-wheat mixture.
8. Bouillon with chili seasoning - add 5 oz of chili seasoning** to 9 quarts of bouillon. Allow mixture to simmer for several minutes. Stir well before serving. Serve 1/3 cup of prepared bouillon for 2 crumbled wheat wafers.
9. Tomato-vegetable soup - follow directions on large package. Makes 9 quarts of soup. Serve 1/3 cup over 2 crumbled wheat wafers.
10. Spaghetti sauce - add 3 quarts of tomato juice to 12 packages (1-1/2 oz size) of spaghetti sauce mix (dry); blend, add 6 quarts more of tomato juice. Simmer 10 minutes. Serve 1/3 cup over 2 crumbled wheat wafers.

2.6.4 Measurements

A record was kept of the amount of each meal consumed by each shelteree. Of special interest was the acceptability of the diet to very young children (less than 5 years old). Suitable conventional foods were

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* All ingredients, other than the wheat wafers, were purchased in local supermarkets. Quantities are as used in the Shelter. Sizes of commercially available packages changed considerably by time of publication.

** This is not ordinary chili powder; in addition to the chili pepper it contains vegetables, herbs and spices, wheat flour, salt, and sugar.

maintained as part of the medical supplies to form a backup if any child rejected the diet completely. In a terminal questionnaire, participants were asked to rate the diet as well as other features of the shelter in terms of discomfort produced. Any medical condition ascribable to the diet was also recorded.

Since previous experiments have shown that the diet is acceptable to an adult male population habituated to institutional meals, the main emphasis in this test was the suitability of the diet for a wider range of ages and its effect on the morale of middle-class families.

2.6.5 Facilities

The food service facilities used in the July 1960 test[4] were again employed. The only significant change was the substitution of throw-away plastic-coated paper cups for the all-plastic reusable cups of the previous experiment. This change was made in view of the difficulty (and waste of water) in cleaning the plastic cups encountered in the July 1960 experiment.

2.7 SHELTER MANAGEMENT

2.7.1 Organization

The shelter organization of the two previous experiments was used again. Participants were organized into 10 units of 10 people each. Family groups were kept together. Each unit elected a leader to work with the Shelter Commander in governing the shelter. Each shelteree wore an armband carrying a letter (A to K, less I) indicating the unit and a number (1 to 10).

2.7.2 Task Assignments

Each shelteree over age 12 was assigned a task to perform during part of each day. There were ten different tasks to which shelterees could be assigned. Assignments were made by requesting volunteers. One researcher or shelteree was placed in charge of each task as a "task leader". These positions and duties were:

a. Clerk. The Clerk will maintain a written log for the Shelter Commander, including minutes of the unit leaders' meeting. The Clerk will also guard the communication system (stand by for incoming messages) during the hours of 0700 to 2300. He should be selected on the basis of applicable past experience. Three clerks are required, each standing an approximate watch of five hours during waking hours. They report to the Shelter Commander.

b. Shelter Physician. The Shelter Physician will be a qualified medical doctor and will be responsible for the medical condition of the shelterees. He will be assisted by two medical assistants to aid him in routine tasks, such as taking daily weights and temperatures of all shelterees. The Shelter Physician will be responsible to the Shelter Commander.

c. Engineer. The Engineer will be responsible for maintaining and operating the shelter equipment. This includes maintaining the communications equipment, putting up and taking down the bunks, and the like. He will be assisted by six shelterees and will be responsible to the Shelter Commander.

d. Librarian. The Librarian will issue paperback books to the shelterees, collect unused books at the end of each recreation period, and stow the book cartons. The Librarian will be assisted by two shelterees and will be responsible to the Shelter Commander.

e. Recreation Clerk. The Recreation Clerk will aid the Shelter Commander in issuing and retrieving recreation equipment during recreation periods. The Recreation Clerk will be assisted by five shelterees and will be responsible to the Shelter Commander.

f. Food Supervisor. The Food Supervisor will prepare and serve meals and clean up after meals. She will also keep a record of the amount of food consumed by each shelteree. She will be assisted by twenty shelterees, and will be responsible to the Shelter Commander.

g. Measurements Engineer.* The Measurements Engineer will take and record readings of the shelter's O_2, CO_2, temperature, humidity, and noise levels. He will be assisted by one shelteree and will report to the Shelter Commander.

h. Child Care Supervisor. The Child Care Supervisor will have charge of assigned children for group play. The assignment of children to group play sections and the method of supervision will be approved at the unit leaders' meetings. The supervisor will be assisted by sixteen shelterees and will be responsible to the Shelter Commander.

i. Sanitary Engineer. The Sanitary Engineer will be responsible for the cleanliness of the shelter spaces. He will be assisted by five shelterees and will report to the Engineer.

j. Photographer.* The Photographer will record, through movies and still photography, significant events and activities of the shelter stay. He will report to the Shelter Commander.

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* Billet to be filled on experimental tests only.

Task leaders were to instruct and supervise assigned shelterees in their respective duties. The task leader was expected to consult the Shelter Commander on problems that arose that required action beyond the control of the task leader.

2.7.3 Living Schedule

An event schedule was developed for the experiment that included a provisional routine for shelter living. This routine was instituted initially by the Shelter Commander but was subject to modification by the shelterees through their unit leaders. The event schedule is given in Table 2.1.

2.7.4 Special Activities

In general, special activities were not planned in advance. The Shelter Commander was to be receptive to spontaneous proposals for group activities originating at the unit leaders' meetings or from individual participants. Two special activities were planned:

1. An arrangement was made for a person outside the shelter to cut the commercial power supply to the shelter at some time not known to those participating in the experiment. The Shelter Commander was to attempt to control any incipient panic in the dark shelter, turn on the emergency flashlights, and start the auxiliary generator to restore power.
2. A Protestant minister and a Roman Catholic priest were invited to conduct services in the shelter on Sunday. This arrangement was made for the convenience of the volunteers. The quiet period which ensued also proved satisfactory for the taking of environmental measurements.

2.8 CHILD CARE

Some discussion and planning was carried out prior to the test with regard to handling of children in the shelter. Toys, books, and games for different age groups were purchased. The range of this recreational equipment was larger than might be selected for actual use in a shelter in order that various possibilities might be studied. Typical materials available were paper and crayons, playroom scissors, modeling clay, children's books, table games, and small cars and block sets. In addition, some of the general recreation equipment, such as shuffleboard, playing cards, and paperback books, were of use.

A meeting was held with the parents of the pre-school children to discuss the plans for the test. This discussion covered arrangements for feeding, sleeping, play and general care. The parents were encouraged to bring a small amount of customary baby foods in the event the experimental

Table 2.1

November Event Schedule

No.	Date	Time	Event	Personnel
1	4	0800	Check Condition III.[3,4] (Shelter standby condition)	Strope, Pond*
2		1000	Check out food preparation procedure.	Strope, Taylor
3		1300	Check operating equipment, communications.	Strope, Pond
4		1545	Bus leaves USNRDL.	Schultze
5		1745	Bus arrives Camp Parks.	Schultze
6		1745	Muster all participants.	Strope
7		1745	Check recorders and cameras.	Brooks**
8		1745	Perform necessary medical exams.	Etter
9		1810	(Approx.) Open shelter door, follow procedure for setting Condition I.[3,4] (Blast alert condition)	Strope, Schultze
10		1815	(Approx.) End loading shelter. Set Condition I..	Strope, Schultze
11		1816	SC explain condition, introduce cadre, organize sections.	Strope
12		1830	(Approx.) Announce all clear. Set Condition II.[3,4] (Fallout alert condition - normal shelter occupancy condition)	Schultze
13		1830	Make environmental measurements.	Perry
14		1830	Begin preparations for evening meal.	Taylor
15		1835	Organize sections. Select section leaders. (Set up table.) Issue armbands. Mark ditty bags and hang up.	Strope, Schultze

* Engineering Support - not a shelter occupant
**Photographer

Table 2.1 (continued)

No.	Date	Time	Event	Personnel
16	4	1850	Reseat on floor in sections. Describe and assign jobs.	Strope
17		1855	Make environmental measurements (hourly).	Perry
18		1900	Engineers charge toilets while remaining jobs are assigned.	Schultze, Strope
19		1915	Assign tasks. Set up tables and benches, then set up chairs for others.	Schultze
20		1920	Food handlers report.	Taylor
21		1930	Division I* seated for dinner.	Taylor
22		2000	Division II seated for dinner.	Taylor
23		2030	Put up bunk system. (Take down most of seats.)	Schultze
24		2045	Assign bunks; young children to bed; others as may desire.	Strope, Schultze
25		2115	Unit leader meeting; adult recreation or discussion.	Strope
26		2200	Recreation or record concert as group desires.	Strope
27		2245	All persons except watch encouraged to go to bed.	Strope, Schultze
28		2300	Reduce lights; set night watch.	Strope, Schultze
29	5	0100	Change the night watch.	
30		0300	Change the night watch.	
31		0500	Change the night watch.	
32		0700	Lights on; Division II prepare for breakfast; start breakfast preparation.	Schultze
33		0720	Food handlers report.	Taylor
34		0730	Division II seated for breakfast.	Strope
35		0735	Take down one side of bunks (48) plus about one-half other side.	Schultze

* Fifty shelterees eat at a time. Division I consists of units A-E. Division II consists of units F-K.

Table 2.1 (continued)

No.	Date	Time	Event	Personnel
36	5	0800	Division I seated for breakfast.	Strope
37		0810	Lay out shuffleboard; set up privacy room; prepare for recreation period.	Schultze, Kendall
38		0830	Recreation period.	Kendall
39		0900	Electric shaver available.	Etter
40		1030	Coffee available.	Taylor
41		1200	Prepare for lunch.	Taylor
42		1220	Food handlers report.	Taylor
43		1230	Division I seated for lunch.	Strope
44		1300	Division II seated for lunch.	Strope
45		1330	Clean up area; start recreation.	Schultze, Kendall
46		1530	Coffee available.	Taylor
47		1730	Prepare for evening meal.	Taylor
48		1730	Sick call.	Etter
49		1745	All recreation gear recalled.	Strope
50		1750	Food handlers report.	Taylor
51		1800	Division II seated for dinner.	Strope
52		1830	Division I seated for dinner.	Strope
53		1900	Finish meal; clean up shelter; unit leader meeting.	Schultze, Strope
54		1925	Prepare for evening program	Strope, Schultze
55		1930	Evening program.	Strope
56		2030	Set up bunks; young children to bed.	Schultze
57		2130	Music; children to bed.	Strope
58		2300	Reduce lights; set night watch.	Strope, Schultze
59	6	0100	Change night watch.	
60		0300	Change night watch.	
61		0500	Change night watch.	
62		0700	Lights on; Division I prepare for breakfast; start breakfast preparation.	Strope, Taylor

Table 2.1 (continued)

No.	Date	Time	Event	Personnel
63	6	0720	Food Handlers report.	Taylor
64		0730	Division I seated for breakfast.	Strope
65		0735	Take down one side of bunks plus one-half other side.	Schultze
66		0800	Division II seated for breakfast.	Strope
67		0810	Set up privacy room; electric shaver available.	Strope, Schultze, Etter
68		0830	Recreation period.	Kendall
69		1000	Coffee available.	Taylor
70		1130	Prepare for lunch.	Taylor
71		1200	Division II seated for lunch.	Strope
72		1230	Division I seated for lunch.	Strope
73		1300	Clean up; Protestant service.	Schultze, Strope
74		1400	Give questionnaire to young people.	Strope
75		1430	Coffee available.	Taylor
76		1500	Give questionnaire to adults.	Strope
77		1600	Catholic service.	
78		1700	Clean up shelter.	Schultze
79		1730	Ceremony.	Johnson*
80		1745	Press conference.	Strope
81		1800	Leave shelter.	Strope

* OCDM - not a shelter occupant

diet was not accepted by the child. Otherwise, all necessities, such as disposable diapers and the like, were provided. Several large cardboard cartons were included for use as cribs and playpens.

One person was given major responsibility for the planning and supervision of the care and activities of the children, particularly the group under 12 years of age. It was also planned to assign 16 shelterees (mainly teenagers) to this activity of supervised care and recreation for children. It was felt that mothers, although they would have the ultimate responsibility for their own children, should be relieved of much of the constant supervision, particularly with relation to recreational activity.

2.9 SHELTER QUESTIONNAIRES

A terminal questionnaire, similar to that used in the previous experiments, was administered to the adult population shortly before the end of the shelter stay. A simple questionnaire was also prepared for the children. These questionnaires are shown in Tables 2.2 and 2.3 respectively.

About 1 week after the experiment, a supplementary questionnaire was executed by the adult participants. This questionnaire is shown in Table 2.4.

Table 2.2

Shelter Questionnaire
for Adults

6 November 1960 Shelteree # _____

1.	Could you have stayed in the shelter for a full week?	Yes	No
	-for another 2 weeks?	Yes	No
	-for another 3 weeks?	Yes	No
2.	Would you have volunteered to stay in the shelter if you had known what it would be like?	Yes	No
3.	Do you think you would volunteer to stay in this shelter again at some future date?	Yes	No
4.	In the event this country were attacked and there was a possibility of radioactive fallout, would you seek protection in a shelter like this one for a 2-week period?	Yes	No
5.	Did it seem to you that many of the other adults found living in the shelter to be a difficult hardship?	Yes	No
6.	Did it seem to you that many of the children and young people found living in the shelter to be a difficult hardship?	Yes	No
7.	Was living in the shelter a difficult hardship for you?	Yes	No
8.	Do you think that dividing the people into units with leaders helped to improve living conditions in the shelter?	Yes	No
9.	Do you think setting up a daily routine helped to improve living conditions in the shelter?	Yes	No
10.	Do you think the elected unit leaders were effective in helping run the shelter?	Yes	No
11.	Understanding that it is important to build shelters as cheaply as possible, is there any item or items in the shelter that you feel is not needed?	Yes	No
	If so, what? _____		
12.	Is there any item that should be added to the shelter?	Yes	No
	If so, what? _____		

Table 2.2 (Continued)

13. Indicate which of the following caused you the most discomfort or difficulty during your stay in the shelter. Mark the number (1) after the item that bothered you the most, mark the number (2) after the item that bothered you second most, etc.

a.	Restricted use of water for purposes other than drinking	_____
b.	Lack of space, or crowdedness	_____
c.	Air ventilation or heat	_____
d.	Boredom	_____
e.	Sleeping conditions	_____
f.	Eating conditions	_____
g.	Concern about what might be happening outside the shelter	_____
h.	Experimental shelter diet	_____
i.	Difficulties with leaders	_____
j.	Difficulties with people in your unit	_____
k.	Difficulties with adults in other units	_____
l.	Difficulties with children	_____
m.	Concern that some accident might occur in the shelter	_____
n.	Noise	_____
o.	Lack of cleanliness, or dirt	_____
p.	Other: _____	

14. If you had to stay in this shelter until you felt you could stay no longer, which of the above items do you think might cause you to leave? Circle the letter in front of the item or items you select.

15. COMMENTS:

Table 2.3

Shelter Questionnaire for Children

You are taking part in an important experiment to help find the answers to how well you and your family and your neighbors could live together in a shelter such as this for as long as two weeks in case an atomic bomb should ever be dropped in the Bay Area.

We would like to know <u>your</u> answers to a few questions. Some of the most interesting ones will be printed in the BULLETIN, (published bi-weekly at the U. S. Naval Radiological Defense Laboratory) or perhaps other papers.

ARE YOU HAVING FUN IN THE SHELTER?

WHAT DO YOU LIKE BEST?

IS THERE ANYTHING THAT YOU DO NOT LIKE?

PLEASE WRITE (IN ABOUT 50 WORDS OR LESS) WHAT IT IS LIKE TO LIVE IN THE SHELTER -- the food, where you sleep, your playmates, what you have been doing?

Signed (your name) _____

Thank you for your cooperation

Table 2.4

Supplementary Shelter Questionnaire

Dear _____:

As a follow-up to the shelter experiment of 4-6 Nov 1960, it would be appreciated if you would answer the following questions. Your answers will be very useful in preparing the report on this experiment. Please return the questionnaire as soon as practicable to Code 901, USNRDL.

1. As a result of your experience in the shelter, how do you feel about the possibility of surviving a nuclear attack? (Circle one)

1. Enthusiastic 2. Encouraged 3. Dubious 4. Discouraged.

2. What advantages do you ascribe to survival in a group shelter?

3. What disadvantages do you ascribe to survival in a group shelter?

4. Did you or any members of your family develop an upper respiratory disease (colds, etc.) in the week following the shelter test? If so, when did they develop and indicate duration and degree of severity.

Table 2.4 (Continued)

5. Did you or any members of your family experience any disturbance of the gastro-intestinal tract (constipation, diarrhea, excess gas, etc.) during or following the shelter test? If so, when did they develop and indicate duration and degree of severity. Do you attribute these disturbances to the shelter diet or to shelter living?

6. Did you or members of your family try the dentifrice tablets provided? If so, do you consider them satisfactory for temporary dental hygiene?

7. Please comment in general terms on any other medical or health problems or changes in your normal living pattern that you feel had any relationship to the time spent in the shelter.

8. Our inventory indicates very modest expenditure of toilet paper, toilet seat covers,paper towels and waterless hand cleaner. Were these items available to you and members of your family in adequate quantities?

9. Do you have any detailed comments on the adequacy or inadequacy of the bunk system?

Table 2.4 (Continued)

10. Assuming an adequate level of organization, how do you feel about the number of people the shelter could hold? (Circle one) 1. Could have held more. 2. Was about right. 3. Too crowded; should have held less.

11. What problems that we encountered in this experiment do you believe would have become much more severe if we had stayed in the shelter a full week?

12. In retrospect, do you have any additional comments that would lead to a better or cheaper shelter?

SECTION 3

RESULTS

3.1 ENVIRONMENTAL MEASUREMENTS

Noise level measurements are given in Table 3.1. The level varied from a minimum of 42 decibels during sleeping hours with the blower off to a maximum of 84 db during periods of unorganized activity. In general, the front of the shelter, being the center of activity and also nearest the ventilation equipment, was more noisy than the rear of the shelter. The sound level varied widely, depending on the nature of the activities going on.

Dry- and wet-bulb temperature measurements are plotted in Fig. 3.1. The weather during the test period was cold and rainy, the dry-bulb temperature varying between 40 and 63° F. The effective temperature in the shelter rose rapidly at the start of the experiment to about 70°. It then increased gradually over the 2-day period to a final level of about 75°.

Oxygen, carbon monoxide, and carbon dioxide concentrations remained normal throughout the experiment and are not tabulated.

3.2 MEDICAL ASPECTS

No unusual medical situations developed during the test. Approximately 10 percent of the group complained of mild upper respiratory infections characterized primarily by a nonproductive cough. All were afebrile.

Two of the mothers with children under 4 years of age did exhibit manifestations of a mild anxiety reaction on the morning of 5 November, the first full day in the shelter. This was characterized by mild precordial pain, complaint of a sleepless night, and a feeling of undue fatigue. These complaints were attributed to overconcern for the welfare of their children and rapidly subsided during the second day as shelter life settled down to an established routine.

Table 3.1

Noise Level Measurements

Date and Time	Noise Level, db Point 3	Point 4	Point 5	Description of Activities
4-1915	76	79	78	Organization by Shelter Commander.
4-2006	81	83	78	50 people at dinner; remainder waiting.
4-2116	80	79	76	Engineer crew erecting bunk system.
4-2143	77	82	77	Women being assigned sleeping locations.
4-2210	82	73	72	Children in bunks; record player playing music.
4-2230	75	69	65	Many shelterees in bunks; music being played.
4-2308	72	62	58	Lights out; watch set.
4-2355	71	60	57	All but watch asleep.
5-0100	71	59	56	All but watch asleep.
5-0215	72	65	59	All but watch asleep.
5-0300	73	63	59	All but watch asleep.
5-0400	73	64	59	All but watch asleep.
5-0510	73	61	58	All but watch asleep.
5-0615	51	46	42	Blower off; shelterees asleep.
5-0708	77	73	74	50 people at breakfast; almost all people up.
5-0807	81	79	76	Morning cleanup.
5-0918	82	80	77	Recreation period.
5-1030	82	80	79	Recreation; coffee break.
5-1118	79	78	73	Recreation; lunch in preparation.

Table 3.1 (continued)

Date and Time	Noise Level, db Point 3	Point 4	Point 5	Description of Activities
5-1219	81	82	76	Cleanup from recreation activities.
5-1325	80	82	77	Cleanup after lunch.
5-1427	77	80	74	Recreation period.
5-1525	75	78	74	Recreation period.
5-1557	83	83	80	Organization of group exercises for 12-year-olds and younger.
5-1602	75	79	71	Group exercises for 12-year-olds and younger.
5-1605	84	83	82	Confusion following exercises.
5-1612	76	79	74	Group exercises for 12-20 year olds.
5-1840	82	80	79	50 people seated at dinner.
5-1930	81	79	75	Doctor taking temperatures; organizing for skits.
5-2030	81	84	80	Engineering crew erecting bunks.
5-2045	74	74	74	Children going to bed.
5-2216	76	68		Adults still talking.
6-0006	63	54		All but watch asleep.
6-0100	60	60		All but watch asleep.
6-0200	60	60		All but watch asleep.
6-0300	60	58		All but watch asleep.
6-0410	63	55		All but watch asleep.
6-0500	62	54		All but watch asleep.
6-0600	62	59		A few people stirring.
6-0653	62	59	50	Just prior to turning on lights.
6-0715	74	73	71	50 people at breakfast; others still in bunks.
6-0900	72	72	70	Recreation; some people washing.
6-1000	82	80	76	Coffee break.

Omitted

Table 3.1 (continued)

Date and Time	Noise Level, db Point 3	Point 4	Point 5	Description of Activities
6-1130	72	72	70	Quiet period; lunch in preparation.
6-1230	80	80	76	50 people at lunch; cleanup for church service.
6-1350	82	76	77	Children executing questionnaire.
6-1600	-	-	-	No measurement but very low level maintained during Catholic mass.
6-1645	82	82	82	Start of shelter cleanup.

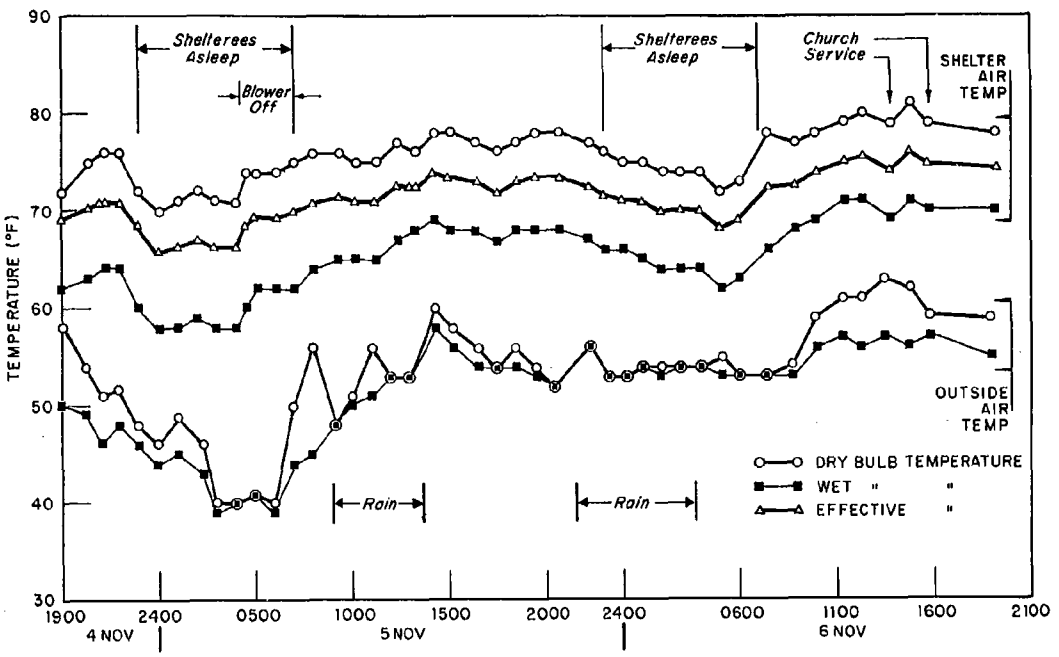

Fig. 3.1 Temperature Measurements

The test did afford an opportunity to observe closely the reactions of one individual who had previously been hospitalized for psychiatric treatment. No undue difficulties were encountered from this individual during the test but he was kept under close observation. He did have to be warned repeatedly against smoking while in his bunk, was observed on several occasions looking into the screened enclosure while the women were sponge bathing, and did exhibit some resentment when some of the small children tried to reuse some modeling clay from which he had fashioned some clay objects.

3.3 SHELTER COMPONENTS

The facilities provided in the shelter proved generally satisfactory for the mixed population. Some congestion was noted occasionally in the front of the shelter. This was caused mainly by the location of the water tap in the food-preparation area. The congestion was noted particularly during coffee breaks. Other effects of the location of various facilities in the shelter will be found in sections concerning food service, shelter management, and child care.

The canvas bunk sheets gave no indication of wear during the 2-day test. The "S" hook arrangement satisfactorily prevented the sheet from creeping along the bunk pole (cross pole). The stud-"U"clip combination did not appear to affect the comfort afforded by the bunk system.

The toilet facilities appeared to be adequate and satisfactory for a mixed population. Some concern was voiced, however, about the possibility that very small children might accidently fall into the toilet tank.

The modifications to the air supply system reduced the ambient sound level by about a factor of 10 over that experienced in the July 1960 test. This reduction is based on sound level measurements made at night with shelterees asleep and the blower on. The comparison is complicated by the observation that the night time sound levels shown in Table 3.1 are quite different for the two nights, the first night being noisier than the second. The average sound level on the first night was about 64 db; the average sound level on the second night, 59 db. The change may be accounted for by the general restlessness of the shelter population during the first night in strange surroundings. On the other hand, the data for the first night may have been taken improperly or inexpertly by the watch standers. The data for the second night are in accord with measurements made immediately after the air supply system was modified. Based on the second night data, the sound level was reduced about 13 db over the July 1960 run and about 6 db over the December 1959 experiment.

The enclosed iron counterweight and pulley system for the movable exhaust ventilator did not function as easily as anticipated but the system did allow better space utilization in the rear area of the shelter.

The redesigned corrugated fibreboard chairs survived the test in excellent condition despite constant use and abuse. Repeated assembly and disassembly appeared to have no deleterious effects. Miscellaneous knife marks, pencil marking, and other holes did not weaken the chairs appreciably. The benches, once assembled and reinforced with tape, were in constant use and consequently were never disassembled. At times during the experiment, it was observed that shelterees used the benches to stand on. The only failure resulting from such overload was a partial collapse of the very ends of a bench where the top is cantilevered beyond the pedestal. A thorough inspection of wear on the pedestals because of the rough concrete floor showed very little effect. Perspiration from the seated individuals did not appear to damage the paper product to any great extent.

The portable folding enclosure for sponge bathing received considerable use, especially by the women (particularly for young children). The cracks formed by joints in the folding screen were found to be objectionable at close range but the hanging of a blanket on the exterior remedied this fault.

A total of 183 gallons of water was expended during the 48-hour test. Of this quantity, 60 gallons were used in charging the chemical toilets. The remainder represents the total usage for drinking, food preparation, teeth-brushing, sponge bathing, and waste in the 2-day test period.

The following quantities of supplies were consumed during the 48-hour test occupancy: 4 plastic trash bags, 9 rolls of toilet paper, a small portion of one 200-unit pack of toilet seat covers, 1/3 gallon of waterless hand cleaner, 5 packs of paper towels, 8 dozen disposable diapers, and 1 dozen sanitary napkins.

3.4 DIET AND FOOD SERVICE

A detailed record of the consumption of the experimental wheat diet was kept for the first three meals served in the shelter. The data are shown in Table 3.2 and relate mainly to the consumption of the pilaf-type main dish. The amount of wheat wafers consumed as crackers was not generally recorded. About one-third of the wafers stocked for the test were not consumed.

Some difficulties were encountered in food serivce largely because the food service area was not separated from the rest of the shelter by a barrier. Young children tended to be attracted to the activity so as

to be underfoot. Some concern was expressed as to the hazard of spilling hot liquids on the youngsters.

A total of 683 paper food trays, 768 plastic spoons, and 693 plastic-coated paper cups were used in the 2-day experiment.

Table 3.2

Record of Consumption of Servings at Meals

Meal	Topping	Consumption				
		All	Most	Little	None	Total
11/4 Dinner	Tomato-Vegetable Soup	56	27	13	3	99
11/5 Breakfast	Milk	40	31	20	8	99
11/5 Lunch	Bouillon	58	14	26	1	99
	TOTAL	154	72	59	12	297

3.5 SHELTER MANAGEMENT

The organization of the shelterees into 10 units was quite successful. The small groups were quite cohesive and were used spontaneously by the shelterees in various activities. For example, a game of charades was played during the second day in which each unit tried to outdo the others in the speed with which the charades were solved. The principal objection to the organization voiced by shelterees was directed at the numbered armbands. These devices were apparently too reminiscent of an institution. Name patches would have been greatly preferred.

The living schedule given in Table 2.1 was generally adhered to. Typical activities are shown in Figs. 3.2 and 3.3. The major change observed in this experiment relative to the previous tests was the greatly increased spontaneity of the present shelter population in proposing and executing its own group activities. The charades mentioned above are an example. In addition, an evening program of skits, card tricks, and community singing was organized. Several young adults conceived of and carried out a program of organized exercises for the

Fig. 3.2 Shelter Activities

(A) Let's get started
(B) Sitting back-to-back before "attack"
(C) Assembling fibreboard chairs
(D) Bunk poles; bags for belongings
(E) Feeding a "wee one"
(F) Bedtime

Fig. 3.3 Shelter Activities

(G) Morning chore
(H) Calisthenics
(I) "Chow" time
(J) Charades
(K) Sick call
(L) Test nears end

children. Finally, the engineering task group devised an improved procedure for assembling and disassembling the bunk system. The shelterees in this experiment showed no inclination toward passive acceptance of shelter living conditions. This attitude was further reflected in the high quality of comments and suggestions to the Shelter Commander both verbally and by means of the questionnaires.

The simulated power failure occurred at 1405 on 5 November. As the shelter was plunged in darkness, the initial reaction to the Shelter Commander's directions was very good. Shelterees nearest the location of the flashlights turned them on promptly and the remainder stayed quietly where they were. The Shelter Commander then opened the passageway door and attempted to start the auxiliary generator. The attempt was unsuccessful. The generator motor ran fitfully and then quit. A strong odor of raw gasoline drifted into the shelter. Next, the main transfer switch jammed when an attempt was made to return to commercial power. As a consequence, the shelter was in darkness for about 5 minutes. As the period of darkness persisted, at least one youngster cried in panic and several mothers started to move about in the darkness toward their younger children. However, before a serious situation could arise, several teenagers started singing "I've Been Working on the Railroad" and the rest joined in. This calmed both mothers and children.

It was later determined that the generator had mal-functioned because the idle adjustment had been moved. As a result, the carburetor flooded.

3.6 CHILD CARE

This experiment included families with young children of ages not previously studied in a shelter situation. The age distribution of the shelter participants was:* 0-3:4; 3-6:6; 6-9:8; 9-12:9; 12-15:11; 15-18:5; 18-21:4; 21-45:34; over 45:18. The youngest child was about 3 months old. This section is concerned primarily with those 38 participants who were under 15 years of age.

After the shelterees entered the shelter and the general organization plan had been explained, assignments were made of the many different tasks that were necessary to keep shelter life functioning in a smooth, orderly manner. Volunteers were called for from the teenage group to assist with

* Age interval: number of individuals in the age interval

child care. Not quite enough individuals volunteered and approximately six women were appointed to serve with the group. Of the 15 child care assistants, nine were teenagers ranging in age from 12 to 17, three were mothers with children in the shelter (3 of pre-school age), one was an older woman with no children in the shelter, and two were adult women without children.

As the first evening was devoted to getting a routine established in the shelter, to preparing, serving, and eating dinner, to getting bunks ready for sleeping, and to putting children down for the night, no attempt was made to get this group of 15 girls and women together to discuss plans for caring for the children. The next morning, those assigned to child care were asked to meet after breakfast. Though it had been mentioned to them that they would probably be asked to spend about one hour at this activity, it became apparent that this would not be long enough if the different age groups were considered. The child-care assistants were divided into 3 groups of 5 each so that the morning, afternoon, and evening hours could be covered.

One table was reserved for use by the children. Here 3 assistants worked with children varying in age from 6 to 12 years. The children seemed quite interested and well occupied in using crayons and paper for about an hour and a half. For the small toddlers, a blanket area was prepared in the rear of the shelter out of the traffic lane to the toilet facilities. Here the small children, with 2 assistants, played with toys selected for the pre-school group.

After about an hour and a half, clay-like modeling material was introduced to both groups. The children seemed to enjoy this very much and made quite an effort to be creative. The material also attracted older teenagers who occasionally joined the group to make something. A plastic machine by means of which the dough could be extruded in various forms provided much amusement for the older children from 7 to 12. It was too complex for the 4-to-7 year olds.

Late in the morning, an hour or so before lunch, the children tired of the relative inactivity and began milling around the shelter, restless, noisy, swinging on the bunks and generally adding to the confusion. After lunch, play activities were resumed with fair enthusiasm. The blanket area usually had 2 to 8 children of varying ages occupied there at any one time. They came and went with a rather short span of interest.

Each morning and afternoon there was a coffee break, with coffee served to adults and a powdered carbonated drink to the children. This proved to be quite a chaotic period with most of the children trying to get to the front of the shelter at the same time. Toward the end of the first day, the activities planned for the children seemed to pall. They

were restless and seemed quite bored with everything. It was discovered that, through an oversight, there were no books for the age group 12-to 15 to read. They could have been put to good use.

A variety show was put on just after supper. Unfortunately, this excited the children so that they weren't ready for bed at 9 PM. However, this second night went more smoothly with dinner and settling down for the night being accomplished without the confusion of the first night.

The 3-months-old baby slept in a cardboard box for a crib and was no problem throughout the shelter period. The 13-month-old and 17-month-old babies each slept in a cardboard box at the head of the mother's bunk. The boxes, which were 4 feet by 2 feet by 2 feet, proved very satisfactory both for sleeping and as playpens.

The 13-month-old and 17-month-old children could be kept occupied for short periods of time away from their mothers, but they and a 2-year-old child kept their mothers pretty well tied down throughout most of the shelter period. During the first day, these women showed signs of fatigue and concern.

All persons in the shelter appeared to rest much better the second night. The general attitude and morale seemed greatly improved the next morning. The mothers of small children were more relaxed and less apprehensive about the situation for their children. Many evidently had been quite concerned before they entered the shelter about what it would be like and how their children would adapt to it. Some of their concern had now been allayed by the reality. It was not as they had expected.

The same activity areas were set up for the second day and renewed interest and enthusiasm was shown by the children. This enthusiasm was not shared to the same extent by those chosen to assist in their care. Child care assistants were more reluctant to offer their services on the second day. The older teenage girls, especially those in the 15-to-17 year range, weren't really happy acting as baby sitters, and consequently could not be relied upon to keep the children under control and busy. Other inhabitants of varying ages assisted from time to time.

Because it was noted that when the children were kept busy and occupied, confusion was reduced, the noise level was lower, and the potentially dangerous practice of swinging on the bars of the bunks was not carried on, two reading periods of 30 minutes each were held the second day for two groups of children, the pre-school-age group and the 6-to-12 group. The children were interested and attentive to the reader. The other shelterees were asked to be as quiet as possible and busied themselves with books and games.

The older teenagers spent much of their shelter time occupied with books or various games. The 10-to-14 group seemed to have less to keep them interested and occupied.

A game of charades was organized on the second morning in which the 10 units competed with each other. This group activity was enjoyed by adults and children over 6 alike. Two church services were held on the second afternoon. The quiet atmosphere attained was surprising and gratifying.

The equipment, games, books, and toys used by the children were stored on one side of the shelter, but the activity areas happened to be on the opposite side. Due to the somewhat crowded conditions, getting out this equipment and putting it away proved something of a problem.

3.7 SHELTER QUESTIONNAIRES

The results of the terminal questionnaire administered to 50 adults are shown in Tables 3.3 and 3.4. In addition, the comments given in response to item 15 of the questionnaire (Table 2.2) are recorded in Appendix B.

The children's questionnaire (Table 2.3) was not intended to have technical value but the responses are of some interest. Of 37 children responding, 35 claimed to be having fun in the shelter. About 20 youngsters specifically mentioned a dislike for the food. About 10 specifically mentioned liking the food. About 15 children were enthusiastic about the bunks whereas 8 felt that the bunks were unsatisfactory. The noise and heat were mentioned several times but, in general, the youngsters' descriptions of what it was like to live in the shelter were positive and enthusiastic.

The supplementary questionnaire (Table 2.4) disclosed that, with respect to the possibility of surviving a nuclear attack, 13 adults were enthusiastic, 33 were encouraged, and one was dubious. Twenty-four of the 99 people participating in the experiment developed minor upper respiratory infections in the week following the test. Other comments are too voluminous and detailed to be summarized.

Table 3.3

Adult Questionnaire Summary

6 November 1960 Shelteree # _____

		Yes	No
1.	Could you have stayed in the shelter for a full week?	50	0
	-for another 2 weeks?	45	5
	-for another 3 weeks?	38	12
2.	Would you have volunteered to stay in the shelter if you had known what it would be like?	49	1
3.	Do you think you would volunteer to stay in this shelter again at some future date?	40	10
4.	In the event this country were attacked and there was a possibility of radioactive fallout, would you seek protection in a shelter like this one for a 2-week period?	49	1
5.	Did it seem to you that many of the other adults found living in the shelter to be a difficult hardship?	0	50
6.	Did it seem to you that many of the children and young people found living in the shelter to be a difficult hardship?	2	48
7.	Was living in the shelter a difficult hardship for you?	2	48
8.	Do you think that dividing the people into units with leaders helped to improve living conditions in the shelter?	49	1
9.	Do you think setting up a daily routine helped to improve living conditions in the shelter?	50	0
10.	Do you think the elected unit leaders were effective in helping run the shelter?	44	6
11.	Understanding that it is important to build shelters as cheaply as possible, is there any item or items in the shelter that you feel is not needed?	25	25
	If so, what? Fewer paper cups (10), shuffleboard (3), fewer spoons (3), gum (3), blankets (3), electric razor (3), toilet seat covers (3).		
12.	Is there any item that should be added to the shelter?	37	13
	If so, what? Songbooks (9), storage space (7), name tags (5), quiet times (5), improved food (4), better organization (4), several individual good ideas.		

Table 3.4

Discomfort Index (50 Adults)

Relative Rank	Factor	Mean Rank	No. of Persons Ranking First	No. of Persons* Circling Factor
1	Noise	3.72	12	14
2	Air Ventilation or Heat	4.64	5	8
3	Lack of Space, or Crowdedness	4.96	4	9
4	Sleeping Conditions	5.92	1	6
5	Restricted Use of Water	6.18	1	8
6	Experimental Shelter Diet	6.20	11	14
7	Lack of Cleanliness, or Dirt	7.14	0	3
8	Difficulties with Children	8.18	4	11
9	Concern Over Accidents	8.30	3	1
10	Eating Conditions	9.44	0	0
11	Boredom	9.88	0	8
12	Other Factors	9.92	9	10
13	Concern Over Outside Events	12.08	0	9
14	Difficulties with Other Units	12.96	0	1
15	Difficulties within Own Unit	13.28	0	1
16	Difficulties with Leaders	13.52	0	1
			50	104

* This column indicates the response to question No. 14 (Table 2.2)

SECTION 4

DISCUSSION AND CONCLUSIONS

4.1 ENVIRONMENTAL ASPECTS

Noise and heat (or ventilation) ranked first and second, respectively, on the discomfort index. The ranking of noise is not surprising, since it ranked first in the July 1960 test and second only to seating discomfort in the December 1959 test at the end of 5 days. Noise was not a problem during sleeping hours. During the day, however, the sound level varied between 65 and 84 decibels according to Table 3.1. These levels are 20 to 30 decibels above usual public building noise levels, being associated with factories, office machine rooms, and railway coaches. The noise in the shelter is clearly a function of the activities of the shelterees since the noise level associated with the ventilation system is generally less than 60 db. The range of noise level was wider in this test than in previous tests primarily because some "quiet times" were introduced. Such "noise breaks" generally achieved sound levels of about 70 db. The quiet times were greatly appreciated by the shelterees, as will be noted in the comments of Appendix B. The relief of noise and confusion obviously should be an important objective of shelter management.

The high ranking of heat or ventilation is surprising in view of the fact that the effective temperature ranged between 66 and 76 degrees. The average effective temperature was about 71 degrees, slightly higher than that of the December 1959 experiment but much less than that of the July 1960 test. Heat ranked eighth in December 1959; second in July 1960. It is not clear why this environment, which should have been comfortable by ordinary standards, was found to be uncomfortable by so many participants. Yet the ranking is borne out by the individual comments.

4.2 MEDICAL ASPECTS

Whether or not more serious upper respiratory infections would have developed in a longer test period under these conditions with this span of ages is not known for a certainty, but it is not believed that this would have resulted in any serious problem. If contagious diseases, particularly those associated with childhood, such as measles, mumps, and the like, would have developed, isolation of these cases under existing

shelter conditions would have been very difficult. This, however, is a situation which would have to be anticipated under long-term shelter living and its management would, of necessity, have to be taken care of in the best way possible at the time. One possible solution would be to confine the individual to a bunk as close to the air exhaust outlet as possible and to screen off the bunk with blankets from the rest of the shelter.

The mild anxiety reactions exhibited by some mothers can be handled by reassurance and firm shelter leadership. It is not believed that this will pose a serious problem. Certainly, however, the mothers must be freed of all responsibilities for their infants and small children for a period of several hours a day to allow them to engage in relaxing recreational activities of their own choice. This can be done by organizing activities for the children that will absorb their interest and by showing the mothers early in the shelter period that other individuals can efficiently take care of their children for short periods of time.

As evidenced in this test, mild psychiatric cases can easily be managed under these test conditions but a certain amount of vigilance is necessary. More severe psychotics would have to be restrained or otherwise observed constantly by other individuals whose only responsibility would be that of keeping the psychotic(s) under positive control. This could pose a serious problem, particularly when many young children constitute a proportion of the shelter population. Under actual shelter conditions, it should be anticipated that each shelter population of 100 or more people would include one or more individuals of this type. This would be the case particularly under stress conditions following an attack when latent or otherwise controlled psychotic tendencies might become intensified.

4.3 SHELTER COMPONENTS

A procedure for the assembly and disassembly of the bunk system was worked out during this test that proved fast and efficient. It consisted of unrolling the bunk sheets one on top of the other, erecting the uprights around them, and lifting the sheets one at a time into position.

The use of a stud in the "U" clip connection did not reduce the amount of sheet movement. This is because the sheet slips freely over the bunk pole (cross pole) despite the lacing. Unless some positive means of attaching the sheet to the bunk poles is developed, a device to prevent rotation of the bunk pole serves no useful purpose. The bunk system has now been developed and tested to the point where it represents a reasonable compromise between cost and comfort. Some transmission of movements by the occupants along the sheet still exists but not to an excessive degree.

The toilet facilities proved most satisfactory. The new canvas enclosure, which provides more privacy than the previous version, was acceptable. However, the arrangement is unnecessarily costly. Further efforts should be directed to achieving the present characteristics at reduced cost. One minor design problem was raised during this test. Concern was expressed about the possibility that a small child might fall into the toilet tank. One possible solution would be to spring-load the toilet seat so a small child could not raise it. Other possible design changes should be explored.

It may be concluded from the data taken in this test that the air supply system noise level does not contribute significantly to the noise problem in the shelter. The provision of acoustic treatment in the shelter would improve the situation but does not appear to be desirable because of the cost and the hazard to the occupants if the shelter is subjected to blast loading. It seems more appropriate to emphasize the role of shelter leadership, organization, and training in the control of the shelter environment.

For a 2-week shelter occupancy, the newly-developed corrugated fibreboard furniture constitutes a cheap, practical answer to one of the problems of outfitting shelters. Although fibreboard tables were not used in the experiment, it is felt that development of a suitable table could be effected which would cost perhaps 50 percent less than the cost of the conventional tables now used. Several features of the corrugated fibreboard approach are still to be considered, including simplification of table tops, use of impregnated wax fibreboard for ease of cleaning, and the sealing of raw edges to prevent dryrot in storage. Other possibilities of a low-cost approach to furnishing shelters, such as use of plastics or fibre glass, should be investigated.

The portable folding enclosure received considerable use during the experiment, especially by women. Although the enclosure used was rather makeshift, it did demonstrate one acceptable solution to the problem of providing privacy.

183 gallons of water were used in this experiment, of which 60 gallons were used to charge the chemical toilets. The projected 2-week consumption would be 921 gallons. This may be compared with 950 gallons used in the December 1959 test and a projected use of 1340 gallons in the July 1960 test. In all cases, use of water for drinking and food preparation was not restricted. In this experiment, sponge bathing was allowed. No bathing occurred in the first two tests.

The consumption of some of the sanitary supplies was very much less than would have been predicted, based on the data from the July 1960

experiment. The projected 2-week consumption from this test would have been 28 plastic trash bags, 63 rolls of toilet paper, about 200 toilet seat covers, 2-1/3 gallons of waterless hand cleaner, and 35 packs of paper towels. The projected 2-week usage based on the July 1960 test would have been 21 plastic trash bags, 424 rolls of toilet paper, 675 toilet seat covers, 2-1/2 gallons of waterless hand cleaner, and 57 packs of paper towels. In view of the markedly lower use of toilet paper and paper towels, the supplementary questionnaire asked the participants whether these sanitary items were available to them in adequate quantities. The response indicated that they were in adequate supply. However, a few participants indicated that they had consciously practiced economy in the use of the supplies. From the experience gained so far, it would appear that an adequate allowance per 100 persons in a 2-week period would be 50 plastic trash bags, 100 rolls of toilet paper, 200 toilet seat covers, 3 gallons of waterless hand cleaner, and 50 packs of paper towels.

4.4 DIET AND FOOD SERVICE

Not unexpectedly, the acceptance of the experimental wheat diet was not as general in the mixed population as it had been in previous tests. The children, particularly, varied greatly in their attitudes toward the food. Some refused the wheat wafers entirely. They ate only jam, peanut butter and candy. Some refused the first two meals, but ate well after they became hungry. Others ate well throughout the test. This last group included children down to age 17 months. In general, the small children preferred the dry wafers with jam and peanut butter to the cereal-sauce mixtures. It was also noted that the attitude of the children toward the diet was conditioned by the attitude of the parents. If the parents exhibited an adverse reaction, the children were apt to reject the food.

The fact that about 20 percent of the adults considered the diet as the factor causing them the most discomfort in the experiment is not unusual considering the relatively low motivations involved in such tests and the strong feelings that most people have about food. It is becoming increasingly clear, however, that a diet supplying 2000 calories per day is more than is necessary and that 1500 calories per day is probably adequate.

In revising the diet, advantage might be taken of the fact that a more liquid form of food is indicated. An informal survey revealed a general desire for more "topping" for the pilaf-type mixture. Perhaps a soup would be more acceptable, with the wheat being used in much the fashion that barley, rice and noodles are frequently used in soups. Fruit or tomato juice powders could be packed for long shelf-life, and the tomato juice could be used with the wheat in various combinations. This approach introduces at least two problems: (1) more of the water supply would have to be used in the food rather than as a beverage, and

(2) an additional hazard might be created by distributing hot soup in a crowded shelter. Concern was expressed in this experiment about the possibility of spilling hot liquids on children who tended to get in the way.

This shelter test was particularly useful in pointing up some of the problems associated with food preparation and serving. The following suggestions resulted:

a. Vessels for heating, carrying, and serving liquids should have handles and pouring spouts or lips.

b. Gloves or holders should be provided for handling hot pots.

c. The work surface should be of a proper height for the average woman and should be of a form and material that is easy to clean.

d. The food preparation area should have some barrier arrangement to keep the crowd from pressing in on the kitchen crew. Stray children especially are a problem. Such a barrier might be improvised from furniture already available in the shelter.

e. Food storage and water source should be easily accessible to the food preparation area.

f. Too many food handlers are to be avoided. In this experiment, the assignment of 20 people proved undesirable. Twelve to fifteen would have been sufficient.

4.5 SHELTER MANAGEMENT

The need for a well-trained shelter leader was again demonstrated. One such person is essential; more would be desirable. The delegation of responsibility and authority for major tasks to responsible persons in the shelter must be done if the shelter leader is to perform well. In general, these "task leaders" should be regarded as part of shelter leadership and kept distinct from the elected unit leaders who must represent the desires and complaints of the shelter population. These experiments point up the difficulties of training task leaders after the shelter is occupied. As much as possible, the organization and training should be accomplished in the pre-shelter phase.

The successful division of the shelterees into small social groups offers many advantages. The unit leaders offered a ready avenue for the expression of ideas and the organization of group activities. It seems, however, that the unit leaders could be given more definite responsibility, particularly in matters of discipline and group standards. The shelter leader should make every effort to mediate his requirements through the agency of such a body.

Written advice or instructions on proper management techniques and plans should be included in every shelter, even if trained leadership is

available. This experiment clearly demonstrated the necessity for a comprehensive schedule of organized activities, especially for the children. Quiet times, planned exercises and tension-releasing activities are very helpful in avoiding problems before they take tangible form. Suggestions and materials for group singing, skits, competitions, and crafts should be provided. Materials and games are not needed as much as the ideas on how to include children and adults in activities in which they do not normally engage.

More study is needed on proper task assignments. Such tasks are welcomed by most shelterees as a relief from boredom and as an evidence of personal usefulness. The assignment of tasks, which in this experiment was limited to participants 12 years old or older, can profitably be extended to younger age groups. It may be useful to review the task assignments after several days in the shelter to see if the talents and interests of individuals are being properly accommodated. In some cases, change for change's sake may be desirable, although experience suggests that, once it is adopted, most shelterees find satisfaction in the established order.

The incident of the generator malfunction had a fortunate conclusion. Such situations are of course to be avoided in practice. The unenclosed location of the generator is clearly unsatisfactory in the present experimental shelter.

4.6 CHILD CARE

The children of all ages seemed to adapt remarkably well to the conditions of the shelter. There was no serious difficulty at any time related to either their health or their behavior. There was practically no crying. The small amount of crying that occurred was from the smallest babies, excluding the 3-month-old girl, who did not appear to cry. The children appeared on the whole to be responsible, well-behaved, normal children who would have liked more activity but adapted well to the situation.

The marked contrast in noise level, temperature, degree of confusion and sense of well-being and satisfaction among both adults and children between periods of well-organized activity and periods of disorganized activity make careful preparations for handling of children an important matter. Careful pre-planning for the recreational activity of children should be done. In general, organization and control of all children's activities in the shelter, including eating and sleeping should be as complete as possible. Play or activity areas for children should be designated and carefully adhered to. These areas should be set up by age groups that have similar interests and abilities. The children must be given a proportionate amount of space for their activities.

Responsibility and authority for handling children's activities should be delegated to one person. This person should be the best qualified individual available. Persons with kindergarten or elementary school teaching experience would be very valuable. The 15 assistants assigned in this test proved insufficient. Older teenage boys and men could participate. Teenage girls alone are not sufficiently interested or helpful. Some adult women need to take part.

It would seem best to limit the toys and materials with which children can work and play to a few basic things they may use over and over. A surplus of toys and playthings does not keep them occupied any longer or more happily. Storage for these materials should be convenient to the activity area.

4.7 SHELTER QUESTIONNAIRES

A comparison of the "discomfort index" of this experiment with those of previous tests is shown in Table 4.1. The agreement between the reactions of the mixed population in this population and the male shelterees of the July 1960 experiment is really quite remarkable. It is surprising that temperature and humidity scored second in both instances since the effective temperature in the July 1960 test was so much higher. One possible explanation is that the ranking expresses the discomfort of cold (at night). A number of comments were received in response to question 9 of the supplementary questionnaire that indicated that the porous canvas material combined with a cool draft along the floor made the lowest tier of bunks very uncomfortable even with a blanket. Some corrective action may be required.

Restricted use of water for purposes other than drinking (no baths) scored fifth or sixth in all tests over the short term but rose to first place at the end of two weeks in the December 1959 test. It should also be noted that noise ranked first in the short term but fell to third at the end of the 2-week test. Boredom scored higher among those involved in the 2-week experiment than among those participants who knew they would be underground less than a week. These are the main trends that are evident. In general, the comparison shown in Table 4.1 suggests that: (1) short-term experiments, even of 48-hr length, are very useful, and (2) a gross change in the characteristics of the shelter population does not appear to have a strong effect on the "discomfort index".

Table 4.1

Relative Discomfort Rankings*

Factor	Nov 1959** (3 days)	Dec 1959 (14 days)	Jul 1960 (5 days)	Nov 1960 (2 days)
Noise	1	3	1	1
Air Ventilation or Heat	6	7	2	2
Lack of Space, or Crowdedness	2	2	3	3
Sleeping Conditions	4	5	4	4
Restricted Use of Water	5	1	6	5
Experimental Diet	-***	6	5	6
Concern about Outside Events	7	8	7	10
Boredom	3	4	8	9
Eating Conditions	8	9	9	8
Concern about Accidents	9	10	10	7
Difficulties with Other Units	10	11	11	11
Difficulties with Own Unit	11	12	12	12
Difficulties with Leaders	12	13	13	13

* Rankings adjusted to include only those factors common to all questionnaires.
** See reference 3.
*** Not included in 3 day questionnaire.

APPENDIX A

PARTICIPANTS ——— SHELTER TEST ——— 4 to 6 Nov 1960

Head of Family	Members	Activity
Betty J. Abramo	Dau: Sharron L. Wesley (15)	USNRDL
Anne Bankofier	Single	USNRDL
June Brevdy	Single	USNRDL
Martin G. Brooks	None	USNRDL
Theodore G. Brough	Single	USNRDL
Thomas Brubeck	Wife: Katherine Son: Don (9) Dau: Shannon (7) Dau: Carol (5) Son: Kevin (4) Dau: Barbara (3 mo)	OCDM-SR
Eugene P. Cooper	Wife: Marjorie Son: Philip M. (13) Dau: Deborah (11) Dau: Phoebe (9)	USNRDL
Elwin H. Covey	Son: Brian (15) Son: Bruce (12)	USNRDL
Loren Culbertson	Wife: Wanda	USNRDL
CAPT Harry S. Etter,MC,USN	Dau: Betty (18) Dau: Patty (16) Son: Harry, Jr. (9)	USNRDL
William Gardiner	Wife: Lillian Son: Charles (13)	OCDM-SR
Howard R. Huey, HN,USN	Wife: Evelyn (HN,USN)	SFNS
Allan K. Jonas	Wife: Dorothy Dau: Bonnie Kessenick (12)	CalDisOff
CDR Katherine Kendall	Single	USPHS

Head of Family	Members			Activity
CDR Randolph W. King, USN	Wife:	Margaret C.		USNRDL
	Son:	Randolph W. Jr.	(14)	
	Son:	William A.	(12)	
	Son:	Stephen S.	(5)	
	Dau:	Susan S.	(3)	
Harry Lalor	Wife:	Lovilla		OCDM-SR
Endel Laumets	Wife:	Juanita		USNRDL
	Son:	Kris	(6)	
George Lucas	Wife:	Parialee		Longshoreman
Donald McQuilling	Wife:	Carol		USNRDL
	Son:	Norman	(21)	
	Son:	David	(19)	
	Dau:	Anne	(15)	
	Dau:	Kathleen	(13)	
H. C. Mosher	Single			OCDM-SR
Robert R. Newell	Wife:	Jeanette		USNRDL
John B. O'Rourke	Wife:	Lottie		USNRDL
	Dau:	Patricia	(12)	
	Dau:	Barbara	(11)	
	Son:	Thomas	(6)	
LT Edward S. Perry, USN	Single			USNRDL
Roy Post	Dau:	Patty	(18)	OCDM-SR
	Son:	Steven	(15)	
	Dau:	Ann	(9)	
LCDR Thomas W. Robinson, USN	Wife:	Patricia R.		USNRDL
	Son:	Thomas	(9)	
	Dau:	Patricia J.	(6)	
	Dau:	Cheryl Anne	(4)	
	Son:	Todd R.	(2)	
CAPT E. B. Roth, USN	Wife:	Joan H.		USNRDL
	Dau:	Susan E.	(13)	
	Dau:	Linda C.	(11)	
	Dau:	V. Louise	(6)	
Donald P. Schultze	None			USNRDL
John Upsher Smith	Wife:	Virginia		OCDM-SR
	Son:	Breck	(12)	
	Dau:	Anita Marie	(8)	

Head of Family	Members			Activity
Richard Soule	None			USNRDL
Walmer E. Strope	Wife:	Doris-Jeanne		
	Son:	Christopher J.	(14)	
	Dau:	Cynthia A.	(12)	
Mrs. Eleanor Taylor	None			Dept of Agriculture
Major F.L. Vuillemot, USMC	Wife:	Annie Lee		USNRDL
	Dau:	Lori L.	(11)	
	Son:	Scott L.	(7)	
	Dau:	Lynne B.	(4)	
	Son:	Rob R.	(13 mo)	
John Winslow	Wife:	Marjorie		USNRDL
	Dau:	Patricia	(17 mo)	

APPENDIX B

COMMENTS ON SHELTER TEST
(Taken from question 15 of Table 2.2)

1. Supervision of children could be improved (not just because I am a bachelor). Two quiet periods each day, before lunch and dinner.

2. Should have name tags--may need more exercise. Work was looked forward to.

3. I was concerned over the apparent lack of junior officers and support organization. The test had a definite one-man-show atmosphere. This resulted in the shelter commander being faced with more than one problem simultaneously, and with petty questions for storage information, etc. The latter were particularly noticeable in the A-group. Further, the incapacitation of the shelter commander would have had serious, if not disastrous, consequences. Elaboration on this comment available on request.

4. Appoint safety engineer and junior assistant.

5. Locate light sleepers where they are not subjected to persons tossing and turning in their bunks. Turning and tossing can be felt on same tier due to sleeper two or three bunks away. More rest periods--less body action thus reducing temperature.

6. Feel there could be better control of children in the matter of noise, etc. Perhaps more concern of parents using more discipline.

7. Believe this was an extremely worthwhile experiment and feel quite lucky to have participated with my family. Regret that my wife had to withdraw due to illness.

8. This has been a most interesting experiment in which to participate. A lot of thought and work went into the planning and I think the project was exceedingly well directed. Perhaps my rating the experimental diet as causing the most discomfort was a bit harsh. However, I do think some things could be added to make the meals a little more tasty.

9. The management and control was excellent. Under the conditions that prevailed, I could have remained for an extensive period. The bedlam that could have occurred would have made these hours (48) seem interminable.

10. If I didn't know this was only for a few days my number 1 discomfort would be the diet.

11. I feel that the experiment served its intended purpose and it was well organized and conducted. The participants seemed to be a good cross section of American average family and all conducted themselves commendably. The food did not appeal to me but I am sure I could stand it in an emergency.

12. I am well satisfied with conditions as is.

13. The experiment was a real good test to us with children. The children took it so well except for the diet. It was well planned and organized. Under real circumstances we could take it even better and with less complaining.

14. Complete organization to keep children busy so as to cut down confusion and noise. Children divided into age groups. Planned exercise of some sort to relieve activity tensions. One person to issue orders and plans for smooth functioning—each person assigned their share of work responsibility. Present leadership excellent. A prepared manual of necessary rules for conduct in shelter. Unit system is good.

15. I am amazed that all these adults have to be led through the questionnaire. Another time just hand them the form and tell them they'll be charged $1 for each item not given a number.

16. It seems to me that everything went extremely well. There were really no major difficulties. A few mechanical things in organization might be improved such as too many hands serving, considering the small amount of space. More organized quiet periods or combined reading-music-sleeping periods, and I definitely think the diet could be improved. No one needs so many calories with so little activity. The wafer is so dry that it has a gagging effect.

17. Nothing actually bothered me at all. My only concern was that some of the children might fall and get hurt while climbing on the bunks. I believe a little more control over the climbing around might correct this.

18. Without exception "_____" (carbonated flavored drink powder) was a big hit with the children. Make hot cocoa available for breakfast, especially for children. Serve smaller size paper bowls and portions to

children. All changes of clothes were used up on the 2 year old--limited capacity of paper diapers to hold water caused excessive leakage, even with 2 and 3 diapers and rubber pants used at once. For a 14 day stay reusing these clothes over several cycles of wet and dry may cause soreness, rash, etc. Not feasible not to wear pants because of rough floor, washing required. Occasional "accidents" by older children require some sort of clothing washing. Use cocoa to make milk palatable.

19. The children's recreation should be supervised and organized to a much greater extent. An elementary school teacher, rather than a nurse, should be in charge, if possible--if not at least consulted on selection of toys, games, and "tricks" of handling small children. Teenagers should be given more responsibility--(ex., blanket distribution and collection, wait on tables.)

20. The age group from 6-12 should be given "jobs." There should be a quiet time each day--reading aloud to different age groups. Traffic control for serving food, needs adjusting. Teenagers to do a program on their own. The toilets are good.

21. I would not participate in a test such as this again (of my own choosing.) I felt very crowded, I thought the diet was terrible and the whole experience very uncomfortable and I also believe very <u>necessary</u>. I realize that all of the procedures are very necessary and would be one of the first to use the shelter in time of <u>emergency only</u>. I find the shelter plan very practical and an ideal way to survive an attack. Very nicely run.

22. #13 extremely difficult to answer. Beyond 1-2-3, none of these things bothered me during the 48-hour stay. (Answer could be very different for an extended time-span.) If my answer were truthful and I weren't averse to fouling up your statistics, it would be 1-2-3, and 12-15's.

23. I think the toilets are lovely. I feel that some sort of action should be taken to make the wheat wafers more attractive to the children, i.e., a cheap way of flavoring them (ones to be eaten with peanut butter and jelly). I think the affair was beautifully organized and I noticed that people, after the first day, settled easily into the routine. I brought many things to do but didn't seem able to accomplish anything--I suppose after a time one would become oblivious to the constant noise. I would dearly enjoy being <u>alone</u>.

24. On the whole I think the shelter was much more comfortable than I expected. I especially enjoyed meeting the people. But something has to be done to make the diet less like sawdust. Perhaps for longer stays, some king of fruit (dried, juice, etc.) could be included. Next test should include minority groups.

25. The diet is too calorie-rich. With the inactivity, 2000 cal/day seems too much. The toppings were fairly good but were usually put on too much wheat so that it was mostly dry by the time it was eaten. Peanut butter was just too dry considering the crumbliness and dryness of wheat. The confusion could be much less aggravating if more enforced periods of silence were held. Everyone listening to music would be good regularly.

26. It is clear that we have <u>not</u> licked all of the shelter problems incident to family occupancy. We could not have been so close to the right answer if the approach were not as fundamental as this—under poorly motivated peacetime conditions it is very likely that a <u>2-week</u> attempt such as ours would have to abort. Therefore, I draw 2 conclusions. 1. Do not try it yet. 2. It should eventually be tried to be <u>sure</u>.

27. Coffee drinkers should be separated from children, otherwise bad burns. There should be at least two quiet sessions during the day. This would refresh adults and children alike. This was a most organized test, handled in a calm, confident manner.

28. Since there is no "place to hide" it is most important to get a kind of mental rest—primarily through the media of "quiet hours." Adults and children can go full blast for several days—but not for much longer.

29. Actually outside of professional concern for accidents which might occur, nothing really bothered me. The group responded very well, I think, and it was a most interesting experience. In a 2-week experience it might be different.

30. Exercises of the "relax" type (not strenuous) should be almost compulsory for all age groups. (In groups—different kinds.) The kids younger than 12 should have jobs and be recognized when they are done. Adults and boys should be mixed in with the child care group with assigned jobs (reading, etc.). Children could help the table setters and servers. Teachers should be consulted about organized play for younger groups. Crayons and paper should be ready the 1st few minutes for very small children too young to listen.

31. I thought the organized activity—both work-type and recreation—was important not only for order but to give people something to do. It makes the time pass quickly and during an emergency it would help keep one's mind off of the situation outside. Shelter life definitely brings out a person's best characteristics. Complaints were not really complaints—just jokes and light talk. The experiment was good contribution to the efforts of working for "massive survival."

32. Organization of recreational time seems essential. Too much permissive recreation becomes dull for adults, makes children unruly, child supervision should be strengthened with more positive demands, "quiet hours" and restricted living areas during portions of the day. Individuals should identify themselves early in the confinement, be given more opportunity to express themselves and participate in shelter government decisions via their leaders.

33. Success depends on handling of children. 1. Quiet time and lights out in bunk area by 2100. 2. Continue idea of noon quiet time. 3. Withhold some of the games and books. Use two speed blower (low speed for night). Blankets necessary at least for children. Require means to stow outer clothes--at least in many climates.

34. Certainly should be many periods of quiet during the day. Believe children would respond to authority 1. if initiated by men and 2. if definite programs of planning activities within (a) own age group and (b) complete group--were initiated at the beginning of shelter life. Evidently, if there are children within a shelter, hardly any permissive activity for them is preferable, though democratic participation within planned activities can be allowed.

35. Might be possible to set up carton on female side for waist high diaper changing near the carton-cribs. Would not have considered most of the items above "difficulties". No difficulties in real emergency. Congrats on good planning. Think the organization for controlling kids would come quickly and easily under 2-week conditions.

36. Probably for a longer stay, a little more organization would make for smooth running, this including quiet times before meals for example, and exercise and game times for younger children. Will say that undoubtedly the unusually high caliber of the participants was one of the top ingredients in what I consider a very successful experiment.

37. It seems to me that this experiment is rather well under way. However, 1. tighter regulations for children and adults, 2. frequent change of pace for children, 3. quiet times for all, 4. a manual for families--how parents can cooperate to gain best behaviour from children, etc., how to condition the family for such an emergency, 5. music--but quiet, and 6. a very interesting experience.

38. It has been a very interesting social experience. I expected to be bothered more by so many people at close quarters, and to feel much more crowded than I did. The minimum but essential organization and leadership, as well as the general helpfulness offered by all, made the real difference in enjoyment. My teenager son "never had it so good", with

3-4 attractive teen girls, I imagine he'd be happy to stay a month more. My 12 year old son, however, had sufficient I'm sure. Boredom appeared to be setting in rapidly—there were fewer kids of his immediate age or interests to keep his own interest sustained. Good job, one and all.

39. More organization needed to care for small children—more quiet and reading periods, etc. Mothers with small children (less than 4 years old) should not be assigned other shelter duties. More duties should be assigned to teenagers and check should periodically be made that they are doing their job. Tiny children should be removed from their mother for at least 3-4 hours daily—mothers then to have their own diversion. The biggest medical problem was these mothers who had concern for their children.

40. The desire to go outside has increased slowly as the days go by. I think of the sun and the blue sky, and I return constantly to the periscope to scan the view field. Even desert grass and hard packed earth outside look oh, so good to me. I know it rained outside while I was in here and I missed the sound of it. I even missed the feel of it, and I missed the rain. Though I know it isn't, it somehow seems perpetually night, here in the shelter, and much further below ground than 3 feet.

41. I was agreeably surprised by the lack of discomforts and inconvenience. There was insufficient control over younger teenagers after lights out. (Too much jumping around in the bunks.) Noise was not too bad at this time. Comment heard that exhaust vent allowed a view of sky (fallout contamination?).

42. This has been a valuable experience for us all, both as government officials and as citizens. The group has been highly selective of course, as every family had one or more members actively engaged in military or nonmilitary defense. In this sense we may have been more sympathetic and more cooperative than the normal population. For a 48-hour experiment, we all relied heavily on USNRDL planning and by OCDM Region 7 at Santa Rosa (which frequently conducts 2 or 3 day working conferences on civil defense or defense mobilization matters); or by the state of California Disaster Office (Mr. Jonas). This shelter might particularly be lived in for 48 hours or more by architects and contractors whom government would rely on to build many more such shelters. Finally, a word of appreciation to Mr. Strope and his associates for a job exceedingly well done. Nothing but praise is due to them all for their planning, leadership, and patience.

43. "The Shelter"
(Sort of a Limerick)

It's a den of noise
Filled with fidgety boys
Our home beneath the firmament
And I'm glad it's a phase
Just lasting two days
Rather than some thing that's permanent.

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